3.5 ENERGY AND NATURAL RESOURCES

This section characterizes existing energy and natural resources available at the project site and in the project area, and describes the project's demand for energy and nonrenewable resources. Potential impacts on these resources are discussed, and mitigation measures are identified. The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 3.5). Where additional information has been used to evaluate the potential impacts associated with the proposal, that information has been referenced.

3.5.1 Affected Environment

Energy Resources

The primary existing energy resources in the project vicinity are electrical transmission lines that traverse the project site. Figure 2-1 presents the existing electrical infrastructure in the project vicinity.

<u>Project Area Electricity</u>

PSE and Kittitas County Public Utility District (PUD) No. 1 provide electrical services within the county, except for within the City of Ellensburg, which provides electrical service within its boundaries. The sources of this power are primarily the Columbia River hydroelectric facilities such as Wanapum Dam operated by the Grant County PUD and the Bonneville Power Administration (Kittitas County 2002a).

Several high-voltage transmission lines traverse the project site (see Figure 2-1) Five sets of Bonneville electrical transmission lines run east to west across the project site, divided into one group of four near the middle of the site and one to the north. One set of PSE electrical transmission lines runs east to west just north of the southern set of Bonneville lines.

- The Applicant has submitted requests for transmission interconnection services for the project to both PSE and Bonneville (Bonneville 2003).

- If connected to PSE's system, the project would interconnect directly with PSE's Rocky Reach to White River 230-kV line.
- If connected to Bonneville's system, the project would interconnect directly with either the Grand Coulee to Olympia 287-kV line or the Columbia to Covington 287-kV line.

<u>Northwest Region Electricity</u>

Regional Demand

Based on data published by the NWPCC, electricity demand for its four-state Pacific Northwest planning region (Washington, Oregon, Idaho, and Montana) was 20,080 average megawatts in 2000 (NWPCC 2003).

As shown in Table 3.5-1, the NWPCC's recently revised 20-year demand forecast shows that electricity demand in the region will grow from 20,080 average megawatts in 2000 to 25,423 average megawatts by 2025 (medium forecast), an average annual growth rate of just less than 1% per year. While the NWPCC's forecast indicates that the most likely range of demand growth (between the medium-low and medium-high forecasts) is between 0.4 and 1.50% per year, the low to high forecast range used by the NWPCC recognizes that growth as low as -0.5% per year or as high as 2.4% per year is possible although relatively unlikely (NWPCC 2003).

Table 3.5-1: Projected Pacific Northwest Electricity Demand, 2000-2025

Forecast Scenario	Electricity Demand (Average Megawatts)			Growth Rates (Percentage of Change)	
	2000	2015	2025	2000-2015	2000-2025
Low	20,080	17,489	17,822	-0.92	-0.48
Medium Low	20,080	19,942	21,934	-0.05	0.35
Medium	20,080	22,105	25,423	0.64	0.95
Medium High	20,080	24,200	29,138	1.25	1.50
High	20,080	27,687	35,897	2.16	2.35

Source: NWPCC 2003.

Bonneville Transmission System

Bonneville owns and operates 15,000 miles of power lines that carry power from the dams and other power plants to utility customers throughout the Pacific Northwest. The Bonneville service area includes Oregon, Washington, Idaho, western Montana, and small portions of Wyoming, Nevada, Utah, California, and eastern Montana.

Generation resources typically require interconnection with a high-voltage electrical transmission system for delivery to purchasing retail utilities. Bonneville owns and operates the Federal Columbia River Transmission System (FCRTS), which comprises more than three-fourths of the high-voltage transmission grid in the Pacific Northwest, and extra regional transmission facilities. Bonneville operates the FCRTS in part to integrate and transmit "electric power from existing or additional Federal or non-Federal generating units." Interconnection with the FCRTS is essential to deliver power from many generation facilities to loads both within and outside the Pacific Northwest.

Public agencies get preference to power from Bonneville. About half the power Bonneville sells goes to Northwest public utility districts, city light departments, and rural electric cooperatives. An additional 15% of Bonneville's annual sales is to investor-owned utilities. Sales to Northwest aluminum companies and a few other large industries account for about one-fourth of Bonneville's annual revenues. After Northwest customers are served, Bonneville sells any surplus power to utilities outside the region.

Bonneville has indicated that portions of the Northwest transmission system are approaching gridlock, resulting in chronic congestion on a number of critical transmission paths, which has curtailed firm power deliveries. One effect of these constraints is that they limit wholesale power trading, which in turn drives up prices for all consumers in the West. As of 2001, approximately 1,000 MW of generation projects under construction had contracted for transferring power over the Bonneville system. An additional 3,000 MW of new generation is proposed by 2004, and developers for nearly 30,000 MW of generation have requested interconnection. While many of the proposed generation projects would not be built, Bonneville has determined that a transmission capacity shortfall of approximately 3,000 MW would occur by 2004 (Bonneville 2001).

Puget Sound Energy Transmission System

PSE is a private company whose electricity services are regulated by the Washington Utilities and Transportation Commission. PSE operates and maintains an extensive electric system consisting of generating plants, transmission lines, substations, and distribution equipment. PSE operates approximately 303 substations, 2,901 miles of transmission, 10,523 miles of overhead distribution, and 8,224 miles of underground distribution lines to serve 958,000 electric customers within a nine-county, 4,500-square-mile service territory in the Puget Sound region.

There are several congestion points in PSE's electrical transmission system. PSE's transmission system, along with the regional high voltage transmission system, is undergoing fundamental restructuring mandated in large part by three different Federal Energy Regulatory Commission (FERC) initiatives – Order 888 and 889, Order 2000, and the Standard Market Design Notice of Proposed Rulemaking.

Released in May 1996, FERC's first initiative, Orders 888 and 889, required all public utilities, including PSE, to file open access transmission tariffs that would make utilities' electric transmission systems available to wholesale sellers and buyers on a nondiscriminatory basis. PSE complied with Orders 888 and 889, and gained FERC approval of its open access transmission tariff.

On December 20, 1999, FERC issued Order 2000 to encourage transmission-owning utilities, such as PSE, to turn operational control of their high voltage power lines over to independent entities called Regional Transmission Organizations (RTOs), while still maintaining ownership of their power-grid assets and receiving revenues from their use. RTOs are intended to provide centralized, unbiased operation of the power grid to promote economic and engineering efficiencies. This regulation required each FERC jurisdictional public utility that owns, operates, or controls facilities for the transmission of electric energy in interstate commerce to file plans for forming and participating in an RTO to FERC by October 15, 2000. In November 2000, PSE and nine other utilities filed the Stage 1 document for the formation of RTO West and received conditional approval to proceed with the development of an RTO. Since the initial filing, a Stage 2 filing has been made with discussions under way on a Stage 3 filing. The filing utilities anticipate several more months of discussion before a more fully developed proposal for RTO West would be filed for FERC approval. Thereafter, the respective company boards would have to decide to proceed and seek state regulatory approvals. Depending on regional support, RTO West could be operational as early as the beginning of 2006 (PSE 2003a).

Planned Generation Projects

As of April 2003, 39 new merchant power generation projects were proposed in the state of Washington, representing more than 10,000 MW of additional generation capacity (see Table 3.5-2). While not all of these would be constructed, it is likely that additional generation capacity would continue to be added in the Northwest during the next two to three years. In 2002, over 1,100 MW of additional capacity has become operational in the region (see Table 3.5-3). Table 3.5-4 lists six additional projects under construction in Washington in late 2003 with their expected commercial operation dates (PSE 2003a).

Table 3.5-2: Proposed Generation Projects in Washington

Facility	Developer	Facility Type	Size (MW)
Bickleton	PacifiCorp Power Marketing, Inc.	Wind	150
Big Horn	PacifiCorp Power Marketing, Inc.	Wind	200
BP Cherry Point Refinery	BP Cherry Point Refinery	Combined Cycle/Cogeneration	720
Columbia River 1	Nordic Electric, LLC	Combustion Turbine	100
Columbia River 2	Nordic Electric, LLC	Combustion Turbine	100
Columbia Wind Ranch	Cielo Wind Power	Wind	80
Cowlitz Cogeneration	Weyerhaeuser Co.	Combined Cycle/Cogeneration	405
Darrington	National Energy Systems Co.	Boiler/Cogeneration	15
Desert Claim	Desert Claim Wind Power LLC	Wind	180
Everett Delta Power Project[1]	FPL Energy, Inc.	Combined Cycle	248
Frederickson (USGECO)	PG&E Generating Co.	Combustion Turbine	100
Frederickson 2	EPCOR	Combined Cycle	290
Goldendale Smelter	Westward Energy LLC	Combined Cycle	300
Horse Heaven	Pacific Winds	Wind	150
Kittitas Valley	Sagebrush Power Partners LLC (Zilkha)	Wind	180
Klickitat Wind[1]	Klickitat County PUD/Wind Turbine Co.	Wind	15
Longview (Mint Farm Industrial Park)[2]	Mirant Corp.	Combined Cycle	286
Longview Power Station[1]	Continental Energy Services, Inc.	Combustion Turbine	290
Maiden Wind Farm	Washington Winds. Inc.	Wind	150
Morgan Stanley, Frederickson	Morgan Stanley Capital Group, Inc.	Combustion Turbine	324
Moses Lake	National Energy Systems Co.	Combined Cycle/Cogeneration	306
Plymouth Generating Facility	Plymouth Energy LLC	Combined Cycle	306
Rainier	National Energy Systems Co.	Combined Cycle	306
Richland (COMPOW)	Composite Power Corp.	Combustion Turbine	2600
Roosevelt (SEENGR)	SeaWest Energy Group, Inc.	Wind	150
Roosevelt Landfill	PUD No. 1 of Klickitat County Intern	Combustion	13
Six Prong	SeaWest Energy Group, Inc.	Wind	150
Starbuck Power Project	Starbuck Power LLC	Combined Cycle	1300
Stateline Wind Project (Wash) Phase III	FPL Energy, Inc.	Wind	200
Sumas Energy 2[1]	Sumas Energy 2, Inc.	Combined Cycle	660

Table 3.5-2: Continued

Facility	Developer	Facility Type	Size (MW)
Sumner (PG&E)	PG&E Dispersed Generating Co.,	Combustion Turbine	87
Tahoma Energy Center	Tahoma Energy Center, LLC	Combined Cycle	270
Underwood	PacifiCorp Power Marketing, Inc.	Wind	70
U.S. Electric Cherry Point	U.S. Electric Power	Coal	249
Waitsburg	SeaWest Energy Group, Inc.	Wind	100
Wallula Power Project[1]	Newport Northwest, LLC	Combined Cycle	1300
Washington (Elcap)	El Cap I	Combustion Turbine	10
Wild Horse Wind Power	Wind Ridge Power Partners (Zilkha)	Wind	165
Zintel Canyon[1]	Energy Northwest	Wind	50

Sources: PSE 2003a; Makarow, pers. comm., 2003; American Wind Energy Association 2003; Northwest Power Planning Council 2003; Washington State University Cooperative Extension Energy Program 2003; Tri-City Herald 2003; Northwest Energy Coalition 2003; and Becker, pers. comm., 2003.

Notes: This project list represents an inventory of projects around the state in various stages of development, but is not intended to be all-inclusive.

1 Project approved.

2 Project approved; construction suspended.

Table 3.5-3: Washington/Oregon Generation Facilities Constructed in 2002

Facility	Developer	Facility Type	Size (MW)	On-Line Date
Boulder Park	Avista Corp	Internal Combustion	25	5/31/2002
Centralia (TRAENE)	TransAlta Energy Corp.	Combined Cycle	248	8/12/2002
Frederickson Power	Frederickson Power (EPCOR)	Combined Cycle	248	8/19/2002
Hermiston	Calpine	Combined Cycle	630	6/1/2002
Klondike	Northwest Wind Power	Wind	25	4/30/2002
Nine Canyon Wind Project	Energy Northwest	Wind	50	9/25/2002

Source: PSE 2003a.

Table 3.5-4: Washington Generation Facilities Currently Under Construction

Facility	Developer	Facility Type	Size (MW)	On-Line Date
Chehalis Power	Tractebel Power, Inc.	Combined Cycle	520	Qtr. 3/2003
Coyote Springs 2	Avista	Combined Cycle	260	Qtr. 3/2003
Goldendale	Calpine Corp.	Combined Cycle	248	Qtr. 2/2004
King County Fuel Cell Plant	Fuel Cell Energy Inc.	Other	1	Qtr. 4/2003
Nine Canyon Expansion	Energy Northwest	Wind	15	Qtr. 4/2003
Satsop CT Project	Duke Energy	Combined Cycle	650	Construction Suspended

Sources: PSE 2003a; King County 2003; Northwest Power Planning Council 2003.

Petroleum Products

Petroleum products, including vehicle and equipment gasoline and diesel fuels, and machinery lubricants are available and would be purchased from numerous commercial outlets in the project vicinity.

Other Nonrenewable Resources

Nonrenewable resources in the project vicinity are primarily gravel extracted from local sources and used locally. Primary consumption of these resources is related to construction projects (sand, gravel, and other mineral resources as used in steel, aluminum, concrete, and other building products). Washington State is ranked seventh in the nation in annual tonnage of extracted sand and gravel. Several gravel pits and quarries are located near the project site, including one just north of proposed turbine F1 off US 97.

Renewable Resources

Renewable resources are materials that can be regenerated, such as wood, other fibers, wind, and sunlight. The primary renewable resource in the project area is wind. The project site sustains a strong wind energy resource that is primarily thermally driven. Warm air rises over the desert-like area east of Ellensburg, and cooler air in the Cascades west of Cle Elum near Snoqualmie Pass is drawn through the Kittitas Valley over the project site in a chimney effect. The rapidly moving cooler air mass is accelerated by the project's ridgelines. The expected 100-year peak wind gust in the Ellensburg area is 73 mph (Wantz and Sinclair 1981). In the 3.5 years that wind data have been collected at the project site, no extreme wind gusts in excess of 73 mph have been recorded.

All markets for wind turbines require an estimate of how much wind energy is available at potential development sites. To provide this information, National Renewable Energy Laboratory (NREL) researchers for the U.S. Department of Energy have been assembling data sets and refining modeling techniques for three decades. In 1981, the program published the *Wind Energy Resource Atlas of the United States*, which was updated in 1987. This wind atlas estimates wind energy resources for the U.S. and its territories, and indicates general areas where a high wind resource may exist.

Areas potentially suitable for wind energy applications are dispersed throughout much of the U.S. Estimates of the wind resource in this atlas are expressed in wind power classes ranging from Class 1 to class 7, with each class representing a range of mean wind power density or equivalent mean speed at specified heights above the ground. Areas designated Class 4 or greater are suitable with advanced wind turbine technology under development today. Exposed areas with a moderate to high wind resource are dispersed throughout much of the contiguous United States. Most of the southeast U.S. and portions of the southwest are not suitable for wind power development.

The Pacific Northwest National Laboratory (formerly known as the Pacific Northwest Laboratory) of the Department of Energy has published estimates of the wind power resource available in the U.S. The laboratory estimates that 9% of the lower 48 states has "good" (Class 4) or "excellent" (greater than Class 4) wind resources. This is reduced to 6% of U.S. land once protected areas, urban areas, wetlands, and other unavailable areas are excluded. While this area does not represent a large percentage of U.S. land, it has the potential to meet more than 1.5 times the present (2003) U.S. power consumption (World Resource Institute 2003).

Compared with other states, Washington is ranked in the bottom tier in terms of wind energy potential (Pacific Northwest Laboratory 1991a). However, the state still has wind potential, as documented in the following studies:

- In the early 1990s, the Pacific Northwest Laboratory estimated that the state could generate 3,700 average megawatts (aMW) of electricity from wind—more than one-third the total amount of electricity the state generated in 1998 (Pacific Northwest Laboratory 1991b).

- NREL made more conservative estimates, measuring wind potential only in areas of the state that met stricter wind classifications and that were located within 10 miles of existing transmission lines. Under these criteria, NREL estimated Washington could generate 3,400 aMW of electricity from wind (NREL 1994).

- In 2002, four research organizations published a survey of renewable resources in 11 Western states called the *Renewable Energy Atlas of the West*. This study found 7,000 aMW of wind potential in Washington. The study used higher resolution data and considered taller and more advanced turbines than those used for the earlier analyses (Land and Water Fund of the Rockies et al. 2002).

- In a 2002 report contracted by the Northwest Energy Coalition, the Tellus Institute identified 1,900 aMW of wind energy potential in Washington looking only at the windiest and most developable locations (Tellus Institute 2002).

An area of good wind energy potential in the state that currently supports wind power projects is the Columbia River corridor along the Oregon-Washington border. The Columbia River gorge provides a low-elevation connection between continental air masses in the interior of the Columbia Basin east of the Cascade Range and the maritime air of the Pacific Coast. Especially strong pressure gradients develop along the Cascades and force the air to flow rapidly eastward or westward through the gorge. Existing wind developments in this area include the 48-MW Nine Canyon Wind Farm in Benton County and the 300-MW Stateline Wind Project in Walla Walla County.

As described above, the Ellensburg corridor in central Washington, where the KVWPP and other wind power projects are proposed (see Section 3.14, Cumulative Impacts), also sustains a strong wind energy resource. Data from several sites throughout the central Washington corridor indicate that exposed areas have a Class 4 to 5 annual average wind resource with a Class 6 resource during the spring and summer seasons (Pacific Northwest Laboratory 1987).

Pacific Northwest Markets for Renewable Energy Resources

Markets for renewable or “green” energy are growing in the Pacific Northwest. RCW 19.29A, Implementation of Retail Option to Purchase Qualified Alternative Power, signed into law in 2001, directed 16 of Washington’s electric utilities to offer a voluntary “qualified alternative energy product” (essentially an electricity product powered by green resources) starting January 2002. The law defined a qualified alternative energy resource as electricity fueled by wind, solar energy, geothermal energy, landfill gas, wave or tidal action, gas produced during the treatment of wastewater, qualified hydropower, or biomass. The statute calls for the utilities to report annually on the progress of these voluntary green power programs to the Washington Department of Community, Trade, and Economic Development (CTED) and the Washington Utilities and Transportation Commission (WUTC). In lieu of reports, agency staff surveyed the utilities in October 2002. The survey produced the following key findings (CTED and WUTC 2002):

- Each of the 16 utilities has a green power electricity product to offer its customers, and 14 of the 16 utilities have implemented voluntary green power programs. The two remaining utilities have secured wind power from a new facility and were initiating their programs after agency staff completed this survey.
- Utilities regularly advertised the green power programs to their customers.
- A total of 1.4 aMW (12.4 million kilowatt-hours) of green power was sold during the first nine months of 2002 to participants in these voluntary programs.
- Wind power represented the vast majority of the green power sales in this year's program (approximately 90%). The remaining resources were landfill gas, hydropower, and solar.
- The resources in the green power programs either have zero carbon dioxide emissions or, in the case of landfill-gas-fueled power, release only 5% of the carbon dioxide that would have been released if the landfill methane gases were emitted directly into the atmosphere.
- Nearly all of the public utilities participating in the survey, as well as seven smaller public utilities that do not offer green power programs to their customers, have added renewable resources to their utility system mix above and beyond that required by the green power option.
- A total of 118 aMWs (1 billion kilowatt-hours) of electricity fueled by wind, landfill gases, and biomass were included in the system fuel mix reports by electric utilities in Washington in 2001.

The results of this survey demonstrate that local and regional markets for green power have been increasing. In particular, there has been a proliferation of requests from Pacific Northwest electric utilities to purchase wind power. Several electric utilities have recently issued RFPs to acquire wind power, including those summarized below:

<u>Puget Sound Energy</u>

On September 9, 2003, PSE issued a draft RFP to acquire approximately 150 MW of capacity from wind power for its electric resource portfolio. The draft RFP is the first step toward achieving the utility's goal of establishing renewable energy as a 10% share of its electric supply mix by 2013 (PSE 2003b).

<u>Avista Corporation</u>

Avista Corporation's 2003 Integrated Resource Plan (IRP) includes wind within its acquisition strategy beginning in the 2008-2010 time frame. The IRP includes an action item for Avista to investigate wind integration issues. In support of an integration issues study, Avista is interested in purchasing between 25 MW and 50 MW of installed nameplate wind-generating capability over a term of between two and five years, and in August 2003 Avista issued an RFP soliciting proposals for wind energy (Avista Utilities 2003).

Portland General Electric

On June 18, 2003, Portland General Electric (PGE) released an RFP to prospective bidders who could meet the company's future power supply needs. The RFP process is part of the company's 2002 IRP, which forecasts PGE's future energy needs and identifies low-cost supply strategies that enable the company to fulfill them (Portland General Electric 2003). In response to the RFP, PGE received more than 90 offers to supply energy. Of the proposals, it was estimated that 20% of the projects are for renewable energy, and by far the greatest numbers of those are wind generation (The Business Journal Portland 2003).

3.5.2 Impacts of Proposed Action

This section describes impacts on energy and natural resources under the proposed action. Direct impacts would result from use of energy and natural resources such as fuel, water, and electricity to construct, operate and maintain, and decommission the project. Direct impacts associated with or attributable to specific project elements such as the proposed turbine towers, O&M facility, and substations are discussed, where applicable. Indirect impacts on energy and natural resources are not anticipated because the project is not expected to substantially induce regional growth to the extent that would result in significant changes to offsite energy and fuel consumption. Table 3.5-5 summarizes potential energy and natural resource requirements under the three project scenarios. Potential water resource impacts are evaluated in more detail in Section 3.3, Water Resources.

Table 3.5-5: Summary of Potential Energy and Natural Resources Requirements

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Construction Impacts			
Increased demand for electricity	Same as middle scenario	Electricity provided by portable generators	Same as middle scenario
Increased demand for petroleum products	Same as middle scenario	25,000 gallons (diesel and gasoline) for mobile construction equipment	Same as middle scenario
Increased demand for water	6.4 million gallons for dust control, compaction, wetting concrete[1]	5 million gallons for dust control, compaction, wetting concrete	5 million gallons for dust control, compaction, wetting concrete
	2.6 million gallons with dust palliative[1]	2 million gallons with dust palliative	2 million gallons with dust palliative
Increased demand for steel	12,000 tons for turbine towers	11,000 tons for turbine towers	13,000 tons for turbine towers
	1,600 tons for tower foundation reinforcement	2,000 tons for tower foundation reinforcement	2,400 tons for tower foundation reinforcement

Sources: Sagebrush Power Partners LLC 2003a, 2003f.

1 For turbines larger than 1.5 MW, roads would be wider (approx. 34 feet wide) to accommodate larger cranes and would require more water for compaction and dust control.

Table 3.5-5: Continued

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Increased demand for gravel (aggregate)	153,417 cubic yards for roads[1]	108,294 cubic yards for roads	Same as middle scenario
	9,111 cubic yards for turbines and crane pads	13,444 cubic yards for turbines and crane pads	16,667 cubic yards for turbines and crane pads
	23,797 cubic yards for other project facilities	23,797 cubic yards for other project facilities	23,797 cubic yards for other project facilities
Increased demand for concrete	25,000 cubic yards for turbine foundations	30,000 cubic yards for turbine foundations	35,000 cubic yards for turbine foundations
Operations and Maintenance Impacts			
Increased demand for electricity	800 MWh/year	800 MWh/year	850 MWh/year
Increased demand for petroleum products	Same as middle scenario	8,500 gallons annually for O&M facility vehicles	Same as middle scenario
Increased demand for water	Same as middle scenario	<1,000 gallons daily at O&M facility	Same as middle scenario
Increased demand for lubricating oils, hydraulic fluids, and mineral oil	Slightly less than the middle scenario	50 gallons/turbine of glycol-water mix	Slightly more than the middle scenario
		85 gallons/turbine of hydraulic oil	
		105 gallons/turbine of lubricating oil	
		500 gallons/pad-mounted transformer of mineral oil	
		12,000 gallons/substation transformer of mineral oil	
Decommissioning Impacts			
	Similar to those described above for construction	Similar to those described above for construction	Similar to those described above for construction

Sources: Sagebrush Power Partners LLC 2003a, 2003f.

1 For turbines larger than 1.5 MW, roads would be wider (approx. 34 feet wide) to accommodate larger cranes and would require more water for compaction and dust control.

Construction Impacts

Energy Resources

The proposed wind turbines and associated facilities, including access roads and underground and overhead collection infrastructure, would be constructed using materials that require energy for their production. Energy would also be required to transport these materials to the project site and to operate construction equipment such as cranes, trucks, tools, and vehicles. Energy consumption is predominantly in the form of gasoline, diesel fuel, and electricity.

Electricity

Substantial amounts of electricity are not required during project construction. Portable generators would produce the electricity required for construction activities. The level of electrical energy consumption required during project construction would not significantly affect locally available energy resources.

Petroleum Products

Fuel consumption during construction would be approximately 25,000 gallons (diesel and gasoline) for mobile construction equipment, construction vehicles, and generators for the three project scenarios. Petroleum fuel for construction equipment would be supplied by existing licensed fuel distributors or local gas stations in nearby communities (Ellensburg or Cle Elum). The EPC contractor would use fuel trucks to refuel construction vehicles and equipment onsite; no fuel tanks would be used or stored at the project site. The level of petroleum products consumed during project construction would not significantly affect locally available resources.

<u>Other Nonrenewable Resources</u>

As identified in Table 3.5-5, nonrenewable resources used to construct the KVWPP would include fuel (diesel and gasoline, discussed above), water, steel, concrete, and gravel (aggregate). Approximately five million gallons of water would be consumed for dust suppression and other construction purposes under the middle and upper end scenarios, while an estimated 6.4 millions gallons of water would be required under the lower end scenario because of the larger roadway footprint. However, if lignin (a non-toxic, non-hazardous compound derived from trees) or another dust palliative is used, it is anticipated that between 2 million gallons (under the middle and upper end scenarios) and 2.6 million gallons (under the lower end scenario) of water would be required. Water would be delivered to the project site by water trucks and obtained from a local source with a valid water right.

Steel would be required to construct the turbines and towers. The estimated amount of steel required would range from 11,000 tons under the middle scenario to 13,000 tons under the upper end scenario. Concrete would be consumed to build roads, crane pads, and turbine foundations. The estimated amount of concrete required for project construction would range from 25,000 cubic yards (under the lower end scenario) to 35,000 cubic yards (under the upper end scenario). Concrete would be purchased from existing suppliers near the project site. Gravel (aggregate) would be required to construct roads, turbine and crane pads, and other project facilities such as the O&M facility, substations, turn-around areas, and meteorological towers. The estimated amount of gravel required for construction would range from 145,535 cubic yards under the middle scenario to 186,325 cubic yards under the lower end scenario. Aggregate would be obtained from existing, permitted local quarries. Several gravel pits and quarries are located near the project site in Kittitas County. For example, there is an existing permitted quarry north of proposed turbine F1. The EPC contractor would make the final decision regarding the source of these materials.

The impacts on nonrenewable resources under the three project scenarios would vary depending on the specific resource. For example, demand for water for dust control and gravel to construct project facilities would be greatest under the lower end scenario because of the larger area required for access roads. However, demand for concrete and steel would be greatest under the upper end scenario because of the greater number of turbines (see Table 3.5-5). The project's nonrenewable resource requirements during construction would not significantly affect local supply.

Operations and Maintenance Impacts

<u>Energy Resources</u>

Electricity

The project would generate energy using the kinetic energy in wind. That energy would be transformed by the wind turbine generators into electricity. Depending on the make and model of wind turbine generator selected, the KVWPP would be rated for 181.5 to 246 MW. MW hours (MWh) are derived by multiplying the project's capacity factor (0.3333) by its nameplate capacity (181.5 to 246 MW) and the number of hours in one year (4,760 hours). Therefore, the project would generate between 287,979 and 390,316 MWh of electricity annually and would increase the availability of renewable energy in the Pacific Northwest, a beneficial effect.

On an annual basis, the project (under all three scenarios) is expected to consume less than 1% of the electricity it generates to support auxiliary systems at the wind turbines such as hydraulic systems, pumps, heaters, fans, controller electronics, and lighting. The projected increased demand for electricity would range from 800 MWh per year under the lower end scenario to 875 MWh per year under the middle scenario (see Table 3.5-5).

The project would not consume a large amount of power for startup. Each wind turbine would be activated randomly depending on the local wind speed at each turbine location. Power consumption would generally result from auxiliary systems at each turbine. The transformers and auxiliary systems at the substation would also consume a small amount of power to stay energized. Electricity for project operations would mostly be generated by the project itself. During periods when the wind turbines are not generating electricity, power would be purchased from the regional utility.

Petroleum Products

Expected fuel consumption under all three project scenarios is estimated to be 8,500 gallons per year to operate O&M facility vehicles. Fuel would be purchased from local gas stations. The level of energy consumption required during project operation would not significantly affect locally available energy resources and would be beneficial to the region by generating an additional source of energy.

<u>Other Nonrenewable Resources</u>

As shown in Table 3.5-5, the project would consume nonrenewable natural resources including fuel and electricity (described above), water, and lubricating oils, greases, and hydraulic fluids. As described in Section 3.3, Water Resources, a new water well would be installed to provide a nominal water supply to the O&M facility. This well, which would provide water for bathroom and kitchen use and for general maintenance purposes, is expected to consume less than 1,000 gallon per day under all three project scenarios.

The estimated amounts of lubricating oils, hydraulic fluids, and mineral oils required for project operation are presented in Table 3.5-5; the amounts would be slightly larger and smaller under the upper and lower end scenarios, respectively, because of differences in the overall number of turbines. Lubricating oils and hydraulic fluids used to operate project equipment and to maintain the wind turbine generators would be purchased from distributors of such materials. The final selection of these distributors would depend on the specific turbine model chosen for the project. The estimated quantities of fuel and other nonrenewable resources required for project operation and maintenance activities would affect the availability of these resources locally or regionally.

Decommissioning Impacts

Impacts attributable to energy consumption during project decommissioning would be similar to those described for the construction phase of the project. Energy consumption, predominantly in the form of gasoline, diesel fuel, and electricity, would be required to operate equipment such as cranes, trucks, tools, and vehicles used to dismantle and remove most project facilities and reclaim disturbed areas. Demolition or removal of equipment and facilities would occur, to the extent necessary, to salvage economically recoverable materials such as steel towers.

3.5.3 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated. However, development by others and of a different nature, including residential development, could occur at the project site in accordance with the County's existing Comprehensive Plan and zoning regulations. Depending on the location, type, and magnitude of future development at the project site, impacts on energy and natural resources could be similar to or even greater than the proposed action.

If the proposed project were not constructed, the region's power needs could de delivered through development of other generation facilities, most likely a gas-fired combustion turbine. The specific type and magnitude of impacts on energy and natural resources would depend on the type and location of facility proposed. For example, if a 60 aMW natural gas-fired combustion turbine facility replaced the proposed wind turbine project, energy consumption impacts during both project construction and operation would increase substantially. Anticipated land requirements for a 60-aMW combustion turbine facility would be more than two times greater than the KVWPP (see Table 2-9). Therefore, the anticipated energy demands to transport materials and operate construction equipment would probably also be greater. Furthermore, unlike wind, which is natural renewable energy source, a combustion turbine project of similar generating capacity would use substantial quantities of natural gas, a nonrenewable resource, as its primary energy source. A combustion turbine facility could also require a significant quantity of water for cooling purposes.

3.5.4 Mitigation Measures

The Applicant proposes to implement energy conservation measures during project construction and operation including, but not limited to, the following:

- Use lignin (a non-toxic wood byproduct) as a dust palliative to reduce water consumption for dust suppression during construction;
- Encourage carpooling of onsite construction crews;
- Use high-efficiency electrical fixtures and appliances in the O&M facility and substation
- control house; and
- Use low-water-use flush toilets in the O&M facilities.

3.5.5 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts on energy or natural resources would occur from project construction, operation, maintenance, or decommissioning.